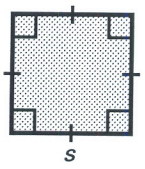
1.7 Introduction to Perimeter, Circumference, and Area

Goals
- Find the perimeter and area of common plane figures.
- Use a general problem-solving plan.

PERIMETER, CIRCUMFERENCE, AND AREA FORMULAS

Formulas for the perimeter P, area A, and circumference C of some common plane figures are given below.

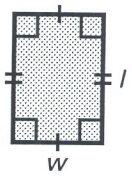
Square
side length s



$P = 4s$

$A = s^2$

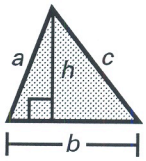
Rectangle
length ℓ and width w



$P = 2\ell + 2w$

$A = \ell w$

Triangle
side lengths a, b, and c, base b, and height h



$P = a + b + c$

$A = \frac{1}{2}bh$

Circle
radius r

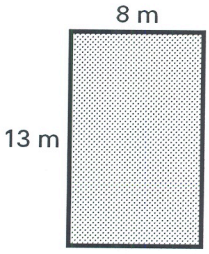
$C = 2\pi r$

$A = \pi r^2$

Pi (π) is the ratio of the circle's circumference to its diameter.

Example 1 *Finding the Perimeter and Area of a Rectangle*

Find the perimeter and area of the rectangle.



Use the formulas for the perimeter and area of a rectangle.

$P = 2\ell + 2w$

$= 2 \cdot \_\_\_ + 2 \cdot \_\_\_$

$= \_\_\_ + \_\_\_$

$= \_\_\_$

$A = \ell w$

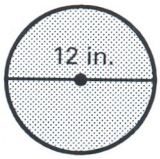
$= \_\_\_ \cdot \_\_\_$

$= \_\_\_$

Answer The perimeter is ___ meters and the area is ___ square meters.

Example 2 *Finding the Area and Circumference of a Circle*

Find the radius, circumference, and area of the circle. Use 3.14 as an approximation for π.



From the diagram, you can see that the diameter of the circle is 12 inches. The radius is one half of the diameter.

$r = \frac{1}{2}(\_\_\_) = \_\_$ in.

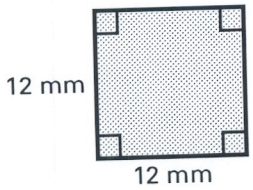
Use the formulas for the circumference and area of a circle.

$C = 2\pi r \approx 2(\underline{3.14})(\_\_) \approx \underline{37.68}$ in.

$A = \pi r^2 \approx (\underline{3.14})(\_\_)^2 \approx \underline{113.04}$ in.^{2}

✔ ***Checkpoint*** **Find the area and the perimeter or circumference of the figure. Use 3.14 as an approximation for π.**

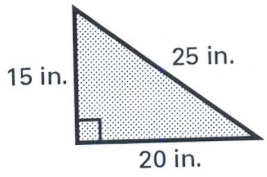
1.



$P =$

$A =$

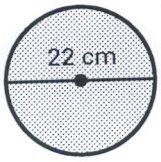
2.



$P =$

$A =$

3.



$C \approx$

$A \approx$

Example 4 *Using the Area of a Triangle*

It might be helpful to draw a sketch of the kite and label the given dimensions. Remember to always check your answers.

Kite Design You are designing a triangular kite with a height of 64 inches and an area of 4096 square inches. What is the base of the kite?

✔ ***Checkpoint*** **Complete the following exercise.**

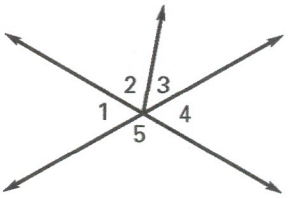
5. You need to buy mulch for a rectangular flower garden. The garden is 6 feet wide and 12 feet long. One bag of mulch will cover 8 square feet. How many bags of mulch should you buy?

9 bags

NAME

TEST TAKING STRATEGY **The mathematical portion of the SAT is based on material taught in your high school mathematics courses. One of the best ways to prepare for the SAT is to keep up with your regular studies and do your homework assignments.**

Multiple Choice **Refer to the diagram below for Exercises 1–3.**



1. Which angles are a linear pair?

   (A) $\angle 1$ and $\angle 2$ (B) $\angle 2$ and $\angle 3$
   (C) $\angle 1$ and $\angle 4$ (D) $\angle 4$ and $\angle 5$
   (E) $\angle 3$ and $\angle 5$

2. Which angles are vertical angles?

   (A) $\angle 1$ and $\angle 2$ (B) $\angle 1$ and $\angle 5$
   (C) $\angle 3$ and $\angle 5$ (D) $\angle 1$ and $\angle 4$
   (E) $\angle 4$ and $\angle 5$

3. Which angles are supplementary?

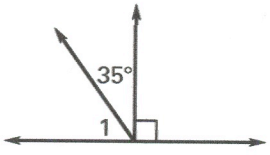
   (A) $\angle 1$ and $\angle 4$ (B) $\angle 4$ and $\angle 5$
   (C) $\angle 1$ and $\angle 5$ (D) B and C
   (E) all of these

4. ***Multiple Choice*** Two angles are supplementary. One angle has a measure that is five less than four times the other. What is the measure of the larger angle?

   (A) 19 (B) 71 (C) 143
   (D) 148 (E) 153

5. ***Multiple Choice*** What is the $m\angle 1$?

   (A) 45° (B) 90°
   (C) 55° (D) 145°
   (E) 155°



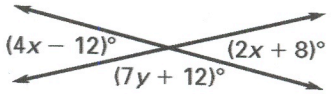
6. ***Multiple Choice*** Find the value of x.

   (A) 13.3 (B) 7 (C) 14
   (D) 26 (E) 25

7. ***Multiple Choice*** Two angles are complementary. One angle has a measure that is twice the other angle. What is the measure of the smaller angle?

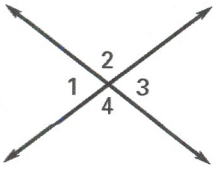
   (A) 15 (B) 30 (C) 45
   (D) 60 (E) 75

8. ***Multiple Choice*** Find the value of y.



   (A) 10 (B) 28 (C) 20
   (D) 152 (E) 128

Quantitative Comparison **In Exercises 9 and 10, use the diagram below and choose the statement below that is true about the given value. The $m\angle 3 = 76°$.**



   (A) The value in column A is greater.
   (B) The value in column B is greater.
   (C) The two values are equal.
   (D) The relationship cannot be determined from the given information.

	Column A	*Column B*
9.	$m\angle 3$	$m\angle 1$
10.	$m\angle 4$	The supplement of $\angle 1$

LESSON 1.7

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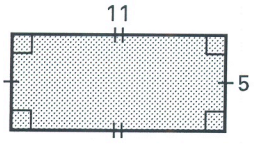
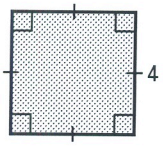
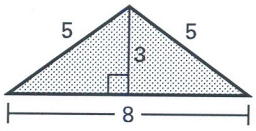
Practice A

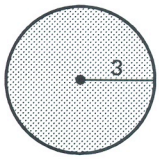
For use with pages 51–58

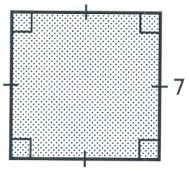
Find the perimeter (or circumference) and area of the figure. (Where necessary, use $\pi \approx 3.14$.)

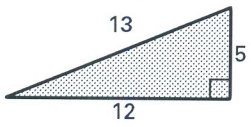
1. 

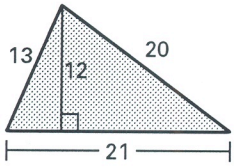
2. 

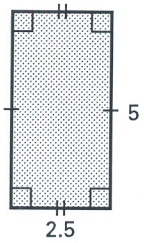
3. 

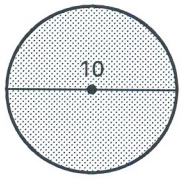
4. 

5. 

6. 

7. 

8. 

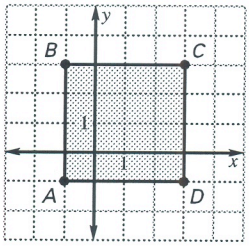
9. 

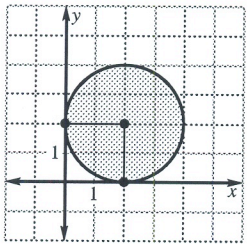
Lesson 1.7

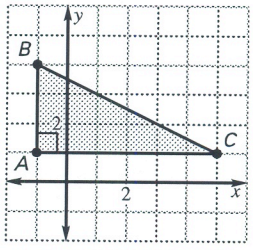
Find the area of the figure described.

10. Rectangle with length 8 centimeters and width 4.5 centimeters
11. Triangle with height 5 inches and base 12 inches
12. Circle with diameter 10 feet (use $\pi \approx 3.14$)

Find the area of the figure. (Where necessary, use $\pi \approx 3.14$.)

13. 

14. 

15. 

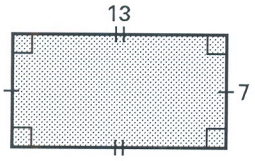
LESSON 1.7

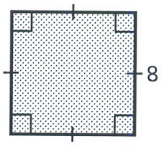
NAME _____ DATE _____

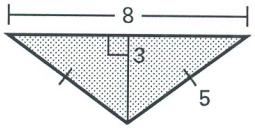
Practice B

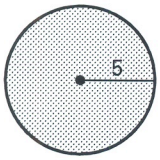
For use with pages 51–58

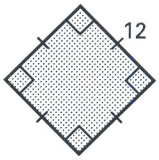
Find the perimeter (or circumference) and area of the figure. (Where necessary, use $\pi \approx 3.14$.)

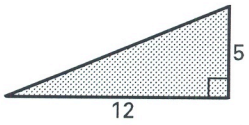
1. 

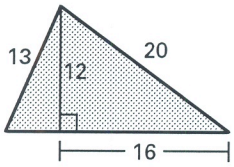
2. 

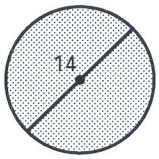
3. 

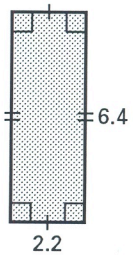
4. 

5. 

6. 

7. 

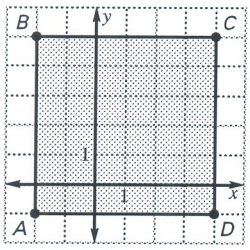
8. 

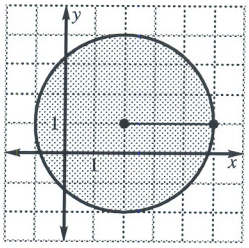
9. 

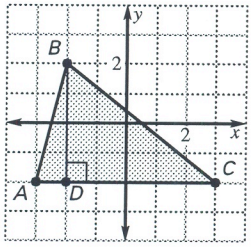
Find the area of the figure described.

10. Rectangle with length 12.3 centimeters and width 5 centimeters
11. Triangle with height 7 inches and base 14.4 inches
12. Circle with diameter 40 feet (use $\pi \approx 3.14$)

Find the area of the figure. (Where necessary, use $\pi \approx 3.14$.)

13. 

14. 

15. 

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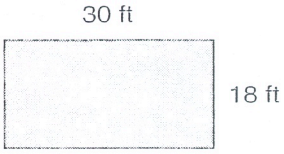
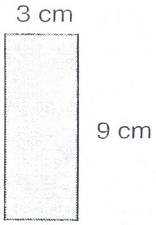
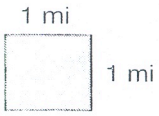
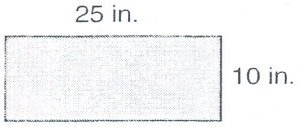
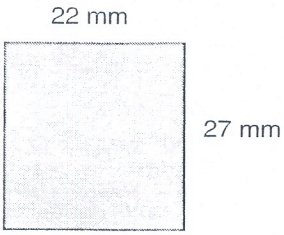
Find the perimeter and area of each rectangle.

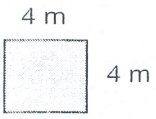
1. 

2. 

3. 

4. 

5. 

6. 

Find the perimeter and area of each rectangle described.

7. $\ell = 7$ ft, $w = 2$ ft

8. $\ell = 2$ in., $w = 1$ in.

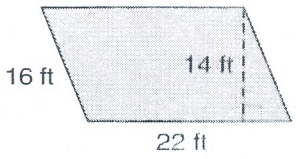
9. $\ell = 26$ cm, $w = 23$ ft

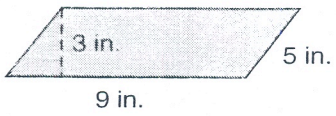
10. $\ell = 9$ mi, $w = 1$ mi

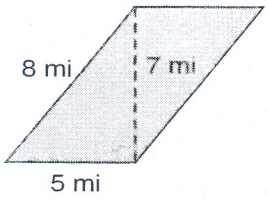
11. $\ell = 7$ m, $w = 7$ m

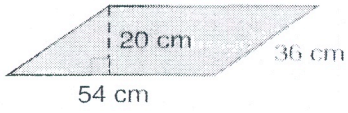
12. $\ell = 5$ yd, $w = 25$ yd

Find the area of each parallelogram.

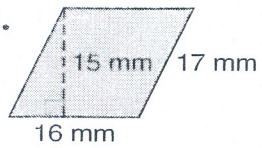
13. 

14. 

15. 

16. 

17. 

18. 

2–3

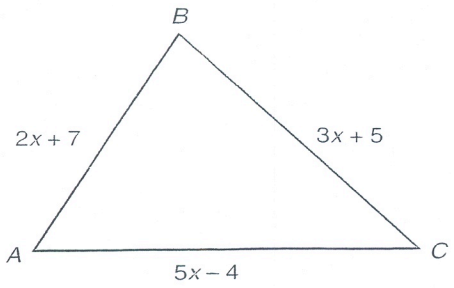
NAME _____ DATE _____ PERIOD _____

Enrichment 1.7 BlueBook

Perimeters and Unknown Values

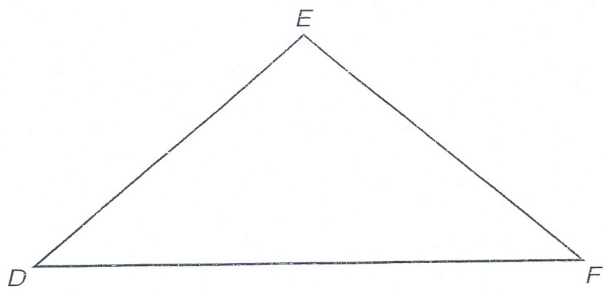
Use the information given to find the unknown values in each of the following.

1.



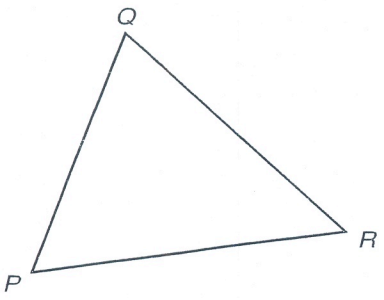
The perimeter is 68.
Find x, AB, BC, and AC.

2.



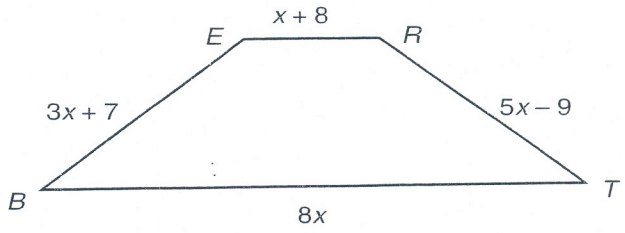
$DF = 3x + 1$, $\overline{DE} \cong \overline{EF}$, $DE = x + 5$
The perimeter is 31.
Find x, DE, and DF.

3.



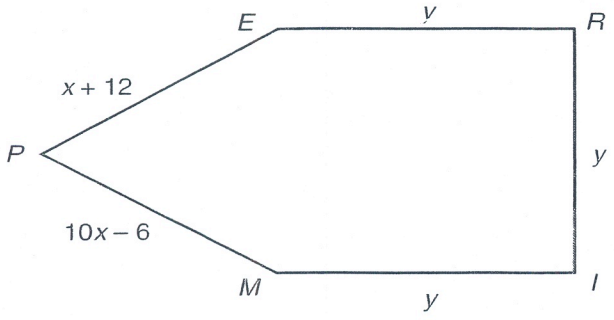
$\overline{PR} \cong \overline{QR}$, $PQ = x + 3$, $QR = x + 6$
The perimeter is 93.
Find x and PR.

4.



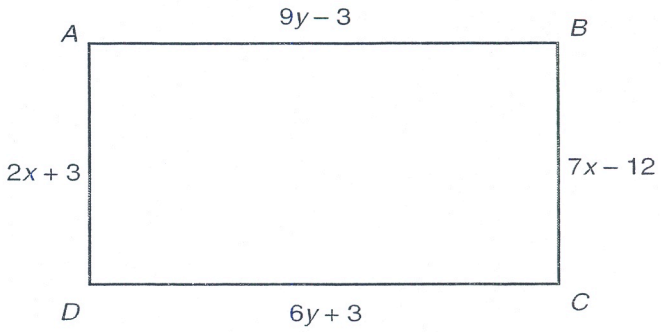
$\overline{BE} \cong \overline{RT}$
Find x, BT, RT, and the perimeter.

5.



$\overline{PE} \cong \overline{PM}$, $y = 5x + 5$
Find the perimeter of the figure.

6.



$\overline{AB} \cong \overline{DC}$ *and* $\overline{AD} \cong \overline{BC}$
Find the perimeter of the figure.